Ventriculostomy related infection prevention

External ventricular drainage (EVD)-related infection (ERI) represents an important condition with potential high morbidity with significant impact on patient outcomes. Prophylactic systemic antibiotics are routinely administered to patients with EVD, but they do not significantly lower the incidence of ERIs. Intraventricular treatment with vancomycin appeared to be safe and effective, but most reports are case-reports/-series and retrospective studies. A prospective non-randomized case-control study was conducted in a consecutive series of 116 patients treated with EVD insertion. In this first prospective study on this topic, we found that intrathecal Vancomycin administration in EVDs does not reduce the occurrence of ERI compared with intravenous cefazolin prophylaxis, but induces selection of gram-negative bacteria [1].

Tunneling > 5 cm away from burr hole [2].

Antibiotic impregnated catheter (e.g., Rifampin + minocycline) significantly reduce the risk of ventriculostomy related infection [3] [4] [5] [6] [7].

Routine catheter exchange at day 5 did not show reduction in the rate of ventriculostomy related infection [8] [9] [10]. Therefore a single catheter may be employed as long as clinically required [11].

Prolonged antibiotic prophylaxis while the EVD is in place does not increase the risk of infection and may select for resistant organisms. However, one dose pre-procedure antimicrobial may be administered.

Systematic reviews

Systematic review of all studies evaluating PSAs and ac-EVD for VRI prevention through July 2010.

Two reviewers independently assessed eligibility and evaluated study quality based on pre-established criteria. Observational studies and randomized clinical trials (RCTs) that fulfilled inclusion criteria were included in the meta-analysis.

Three RCTs and 7 observational studies met our inclusion criteria and were included in the analysis. The type of antibiotics and VRI definitions varied among these studies. Pooled analysis showed a protective effect of PSAs and ac-EVDs for VRI (risk ratio: 0.32; 95% CI: 0.18-0.56). Results showed moderate heterogeneity (I(2) = 53%) explained by the difference in quality among the studies and the inclusion of 1 large positive cohort study. The effect of PSAs and ac-EVDs was unrelated to the type of study (RCT or observational, P for interaction = .55), the route of antibiotic administration (PSAs or ac-EVDs, P = .13), or the quality of the studies (suboptimal vs good/excellent, P = .55).

RCTs and observational-derived evidence support the use of PSAs throughout the duration of external ventricular drainage; similarly, the use of ac-EVDs to prevent VRI seems to be beneficial. Available data are heterogeneous and of suboptimal quality. Further research is needed to confirm the findings of this meta-analysis. There are not sufficient data to compare the protective effect of ac-EVDs and PSAs [12].

Case series

External ventricular drainage is an important therapeutic adjunct in neurosurgical practice. Unfortunately, this procedure has been associated with a significant incidence of ventriculitis. A major source for many of these infections has been bacterial contamination of the tract of the ventricular catheter, at the site where it enters the scalp. To prevent this problem, the authors have devised a new ventriculostomy technique that involves tunneling the ventricular catheter through the scalp, between the dermis and the galea. One hundred consecutive procedures in 66 patients are analyzed in this paper. The average duration of drainage was 6.2 days. There were no infections subsequent to the insertion of the ventricular catheter in this group of patients[13)].

2010

Between 2003 and 2008, 1961 ventriculostomies and infections were documented. A ventriculostomy infection was defined as 2 positive CSF cultures from ventriculostomy catheters with a concurrent increase in cerebrospinal fluid white blood cell count. A baseline (preprotocol) infection rate was established (period 1). Infection rates were monitored after adoption of the standardized protocol (period 2), institution of antibiotic-impregnated catheter A (period 3), discontinuation of antibiotic-impregnated catheter A (period 4), and institution of antibiotic-impregnated catheter B (period 5). RESULTS:

The baseline infection rate (period 1) was 6.7% (22/327 devices). Standardized protocol (period 2) implementation did not change the infection rate (8.2%; 23/281 devices). Introduction of catheter A (period 3) reduced infections to 1.0% (2/195 devices, P=.0005). Because of technical difficulties, this catheter was discontinued (period 4), resulting in an increase in infection rate (7.6%; 12/157 devices). Catheter B (period 5) significantly decreased infections to 0.9% (9 of 1001 devices, P=.0001). The Staphylococcus infection rate for periods 1, 2, and 4 was 6.1% (47/765) compared with 0.2% (1/577) during use of antibiotic-impregnated catheters (periods 3 and 5). CONCLUSION:

The use of antibiotic-impregnated catheters resulted in a significant reduction of ventriculostomy infections and is recommended in the adult neurosurgical population.

1996

The investigators undertook a retrospective analysis of ventriculostomy infections to evaluate their relationship to monitoring duration and prophylactic catheter exchange. In 1984, the results of an epidemiological study of ventriculostomy-related infection were published. One of the conclusions of the paper was that the incidence of ventriculostomy-related infections rose after 5 days of monitoring. This led to the recommendation that catheters be prophylactically changed at 5-day intervals if prolonged monitoring was required. A recent randomized prospective study on central venous catheters showed no reduction in infection with prophylactic catheter exchanges. This has led the authors to reexamine their experience with ventriculostomy infections. Data on 584 severely head injured patients with ventriculostomies were prospectively collected in two data banks, The Traumatic Coma Data Bank and The Medical College of Virginia Neurocore Data Bank. These data were retrospectively analyzed for factors associated with ventriculostomy related infections. It was found that there is a relationship of ventriculitis to monitoring duration but it is not simple or linear. There is

a rising risk of infection over the first 10 days, but infection then becomes very unlikely despite a population that continues to be at risk. Patients in whom catheters were replaced prior to 5 days did not have a lower infection rate than those whose catheters were exchanged at more than 5-day intervals. Based on these data, it is recommended that ventriculostomy catheters for intracranial pressure monitoring be removed as quickly as possible, and in circumstances in which prolonged monitoring is required, there appears to be no benefit from catheter exchange [14].

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